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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,346	09/24/2003	Mohammad Jaber Borran	873.0119.U1(US)	7074

29683 7590 07/28/2006

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EXAMINER

BURD, KEVIN MICHAEL

ART UNIT PAPER NUMBER

2611

DATE MAILED: 07/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/671,346	<b>Applicant(s)</b> BORRAN ET AL.	
	<b>Examiner</b> Kevin M. Burd	<b>Art Unit</b> 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 June 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13-22,34 and 35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-22,34,35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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1. This office action, in response to the amendment filed 6/23/2006, is a non-final office action.

***Response to Amendment***

2. The previous rejection of the claims under 35 USC 101 is withdrawn in view of the amendment to the claims.
3. The claims are rejected as stated below.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 13-22, 34 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 13 recites the limitation "fitting the data sample to at least one point of... an n-dimensional real signal constellation." The specification as originally filed does not show fitting the sample to more than one point in a constellation. Claims 14-22, 34 and 35 are dependent on claim 13.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 13, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo (US 2003/0123877) in view of Hostetter (US 4,866,395).

Regarding claim 13, Lo discloses a symbol detection method for a receiver of a MIMO communication system. Lo discloses the multiple-input/multiple-output communication system in figure 1D. The receiver comprises a plurality of receiving antennas. Figures 4A, 4B, 4C, 4D show the transmitted constellations. This is also stated in paragraph 0098. Figure 4D shows the transmitted constellation of n dimensions. Figure 1D shows the outputting of the detected and recovered symbols from the decoder 26. Lo does not disclose the process of demodulating and decoding the received signal including fitting a data sample to at least one point in n-dimension signal constellation. However, Hostetter discloses mapping a received sample or samples into a signal space as shown in figure 1. Each sample represents a data point in whatever constellation is being transmitted (column 6, lines 43-49). The demodulation process divides the signal space into a structure of zones so that each data point in the selected constellation exactly fits within the divided zone. The zones are defined with boundary lines (column 6, lines 49-67). Any phase or amplitude distortion of the received carrier signal results in a constellation pattern that is misaligned (column 7,

lines 1-5). Figure 5B illustrates this misalignment. Column 7, lines 23-60 describes the error correction process for fitting the misaligned signal points into the appropriate signal constellation. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the method of fitting misaligned constellation points into the proper signal constellation of Hostetter into the communication system of Lo. This allows data that has been interfered with during the signal transmission to be corrected in the receiver so the correct data will be recovered.

Regarding claim 34, Lo disclose the signal constellations in figure 4D. Each point resides in only one of the constellations.

Regarding claim 35, Lo discloses the signal constellations in figure 4D.

6. Claims 14-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo (US 2003/0123877) in view of Hostetter (US 4,866,395) further in view of Falzon et al (US 2003/0210824).

Regarding claim 14, the method of the combination of Lo and Hostetter is disclosed above in paragraph 5. Lo discloses the constellations shown in figure 4D. Each of the constellations comprises points on only one of the constellations. The combination does not disclose the minimum distance between points on the constellation is defined by a maximum minimum Kullback-Leibler distance. Falzon discloses "minimization of the Kullback-Liebler distance for estimating the parameters of the generalized Gaussian model ensures a minimization of the cost of coding in accordance with information theory" in paragraph 0024. For this reason, it would have

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been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Falzon into the method of the combination of Lo and Hostetter.

Regarding claim 15, the constellation points shown in figure 4D of Lo are a closed surface.

Regarding claim 16, the constellation points shown in figures 4A, 4B, 4C and 4D of Lo form a sphere and circle.

Regarding claims 17-19, the constellation points are shown in figures 4A, 4B, 4C and 4D of Lo.

Regarding claim 20, Hostetter discloses the matching of the misaligned constellation point is done by comparing the misaligned point to its proper or expected constellation point.

Regarding claim 21, the point will be fit to the constellations shown in figures 4A, 4B, 4C and 4D of Lo.

7. Claims 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lo (US 2003/0123877) in view of Hostetter (US 4,866,395) further in view of Falzon et al (US 2003/0210824) further in view of Schelstraete (US 2001/0017900).

Regarding claim 22, the combination of Lo, Hostetter and Falzon discloses the method stated above in paragraph 6. The combination does not disclose the step of fitting the data sample comprises determining the SNR and selecting a constellation based on the ratio. Schelstraete discloses the amount of bits in each group and thus each data symbol will depend on the SNR measured at the frequency of the carrier.

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Each data symbol corresponds to a constellation point in a constellation diagram.

Figures 2a, 2b and 2c show different constellations corresponding to 4-bits, 5-bits and 6-bits respectively (paragraph 0031). It would have been obvious for one of ordinary skill in the art at the time of the invention to incorporate the teachings of Schelstraete into the method of the combination of Lo, Hostetter and Falzon. The SNR in a channel will determine the number of bits per symbol that can be transmitted on that channel and can be recovered. This will allow the maximum capacity of the system to be achieved and more data to be sent.

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on (571) 272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kevin M. Burd  
7/24/2006

  
**KEVIN BURD**  
**PRIMARY EXAMINER**